Periscope.

a.—ANATOMY AND PHYSIOLOGY OF THE NERVOUS SYSTEM.

THE PSYCHO-MOTOR CENTRES OF NEW-BORN ANIMALS.—The researches by Prof. J. Tarchanoff (*Revue Mensuelle*, Oct. and Nov., 1878,) were intended to examine further the interesting fact found by Soltmann, that the cortical motor centres are not excitable in the new-born dog until the tenth day, from which time on they successively develop in function. Soltmann concluded that all movements of the new-born animal are purely reflex, and in this view he was confirmed by the absence of all symptoms on destruction of the hemispheres before the tenth day. Subsequently this author found further that at this early period no inhibitory influence on reflex action was exerted by the hemispheres, and that the inhibitory action of the vagus on the heart was also wanting.

Soltmann experimented only on puppies and rabbits, animals which are born blind.

Tarchanoff, however, compared these results with experiments on new-born guinea-pigs. This animal, born with open eyes, is also more developed at birth, as is shown by his bony skull and the existence of furrows (four in number) in the cerebral cortex. In the new-born guinea-pig Tarchanoff could easily excite isolated muscular movements by faradizing the cortical centres. The function of the centres could even be demonstrated on the fœtus of guinea-pigs some days before birth.

The inhibitory influence exerted by the cortex on reflex actions could also be demonstrated in the new-born guinea-pig, by measuring the time a current passing through the hind leg required in order to produce a reflex movement. This time was very considerably lengthened by electric or mechanical irritation of the cortex.

In the new-born guinea-pig the inhibitory action of the vagus on the heart was also marked in Tarchanoff's experiments.

Previous researches by Bibra and by Schlossberger have shown that the fœtal brain contains more water, but less fats and phosphorus than the brain of the adult. It has also been shown that the grey substance contains more phosphorus than the white in the adult, but not in the fœtus.

Repeating these observations, Tarchanoff found less difference between the brain of the adult and the new-born in the guinea-pig, than in either dog or rabbit. For microscopic purposes, the brains were hardened in Müller's fluid; the brain of the new-born guinea-pig was well hardened after four weeks, that of the dog or rabbit at birth required six to eight weeks.

In the brain of the new-born rabbit the cortical grey substance is still in the embryonic state; there is but an imperfect differentiation of the cells, and the subsequent pyramidal shape of the ganglionic cells can scarcely be recognized. The nerve fibres are entirely without myeline.

In the guinea-pig, on the other hand, at the same time of life, the grey substance is almost, though not quite, completely developed, there being still some embryonic cells. The fibres, however, are all medullated.

In order to find some anatomical reason for the difference in the degree of inhibitory influence exerted by the vagus on the heart of adults and fœti, Tarchanoff measured these nerve fibres microscopically. In the new-born rabbit the vagus has but little action on the heart, and its fibres are still very thin. The fibres in the adult are two to three times as thick, and have a medullary sheath five to twenty times as thick as the vagus fibres in the new-born rabbit. The functional power of the nerve increases directly with the anatomical development of its fibres. The want of activity of the fœtal vagus is not due to imperfect development of the inhibitory ganglion in the sinus venosus, since Tarchanoff, differing in this respect from Soltmann, could arrest the heart by exciting the sinus venosus directly.

In the young guinea-pig the vagus is nearly as active as in the adult animal, and accordingly Tarchanoff found but a slight difference between the size and the development of the fibres of the fœtal and adult guinea-pigs.

In order to test his hypothesis, that the action of the vagus depends on the development of its fibres, and especially their medullary sheath, Tarchanoff examined the vagus of the pigeon, in which animal the nerve has but little power over the heart. The fibres were found very thin, and possessing but a feeble minute myeline covering as compared with other nerves of the bird.

As a general fact quite worthy of notice, the author found that the effect of stimulation of *one* vagus is always increased by dividing the vagus of the other side.

In order to study the development of the nervous system under different influences, Tarchanoff cites hereupon a large number of experiments made on litters of puppies, rabbits and guinea-pigs. The animals of one litter were kept in the same conditions in general, but subjected to different experimental influences. Some received daily a few spoonfuls of alcohol, others a small quantity of phosphorus (about $\frac{1}{80}$ grain), dissolved in cod liver oil. Some were put from one to two hours a day into a condition of cerebral hyperæmia by being suspended with the head downward. The brain of others was, on the other hand, rendered anæmic by placing the rear part of the body into a partial vacuum for some hours each day. The influence of the hyperæmia thus produced in the posterior part of the body was at once evident on inspecting the exposed brain. As soon as the air was exhausted from the box in which the animal's hind legs were included, the brain became anæmic and less excitable.

As a result of extended observations, Tarchanoff states that the administration of phosphorus, as well as the repeated production of cerebral hyperæmia, results in a hastening of the opening of the lids, and an increase of excitability of both psychomotor and reflex centres. There is all evidence of a superior development of the nervous system by the use of phosphorus, or production of repeated hyperæmia. Besides, the brain of the animals so treated contains more than the normal amount (at that age) of solid constituents and phosphorus.

The very opposite effects are produced by daily doses of alcohol or the frequent production of cerebral anæmia.

As incidental results, the author mentions further that there is a difference between the two hemispheres in new-born animals. The centres for movements of the limbs are more excitable in the *left* hemisphere, while mastication can be provoked more easily from the right hemisphere. This observation, if applicable to man, would explain right-handedness.

There is a certain correlation between the activity of different cortical centres. The natural act of mastication will, for instance, reduce the excitability of the centres governing the limbs. The cortical excitability is also much reduced by sleep and by derivation of attention, for instance by the sight of meat (young puppies). The same influences diminish also the reflex excitability of the animal. H. G.

SECRETORY AND TROPHIC GLAND NERVES. — R. Heidenhain, *Pflüger's Archiv*, XVIII., p. 1. From his researches on the submaxillary gland of the dog, H. formulates the law, that the *percentage* of salts in the saliva increases with the total amount of saliva, when the secretory nerve (chorda) is irritated up to a certain limit. This increase of salts occurs independent of the physiological condition of the gland. The amount of *organic* solids, however, depends not only on the degree of irritation of the nerve, but also on the state of rest or fatigue of the gland. With the same degree of excitation of the secretory nerve, the percentage of organic solids diminishes the longer the gland has been in action. By increasing the excitation of the nerve, the proportion of organic residue augments likewise. But if the secretory nerve of a fresh (not fatigued) gland be stimulated, the percentage of organic matter will remain high after cessation of the stimulus, and diminish subsequently less rapidly than the inorganic salts. Hence, H. concludes that the secretion of water and salts on the one hand, and of the organic substance on the other hand, occurs under different conditions.

As regards the parotid gland of the dog, H. confirmed the statement of Loeb, that the secretory nerve is a branch of the glosso-pharyngeal nerve, entering the tympanic cavity with the tympanic branch, and passing thence into the cranial cavity to join the superficial pretrosal nerve. It finally reaches the gland with the auriculo-temporal branch of the trigeminus. The other gland-nerve is the sympathetic. The latter contracts the blood-vessels of the gland; the former dilates them. The pressure under which the parotid secretion can still occur, may amount to a column of mercury of 106 to 118 mm. in height, a tension greater than the blood pressure in the smaller vessels.

After prolonged action of the gland, the parotid saliva becomes impoverished in organic constituents ; less so in the amount of salts. By increasing the electric stimulus, both organic and inorganic constituents increase in percentage; but if the gland is exhausted, only the *salts* augment in proportion.

Heidenhain could not find any influence of the sympathetic on the amount